REMARKS

Applicant has thoroughly considered the Examiner's remarks and has amended the claims to more clearly set forth the invention. Applicant respectfully requests allowance of the application in light of the amendments and following remarks. By this Amendment A, claims 1, 4, and 5 have been amended. Thus, claims 1-7 are presented in the application for further consideration.

Rejection Under Second Paragraph of 35 U.S.C. § 112

In response to the Examiner's rejection of claims 1-6 under the second paragraph of 35 U.S.C. § 112, applicant has amended claims 1, 4, and 5 to more clearly set forth the invention.

Rejection Under 35 U.S.C. § 102 -Anticipation

Claims 1-3, 5, and 6 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,884,391 to McGuire et al. Claims 1-6 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,242,997 to Barrett et al. Applicant submits, however, that the cited references fail to teach each and every aspect of the claimed invention.

The McGuire patent merely discloses a process for manufacturing an electrical device comprising a Positive Temperature Coefficient (PTC) element. More specifically, in the process described in the McGuire patent, a plurality of electrically non-conductive gaps are formed in first and second electrodes of a PTC sheet, and then electroplated to form end terminations. Thereafter, the PTC sheet is cut into PTC devices. However, with this process, ***each end termination only has three conductive surfaces (i.e., the upper, the lower and the right surfaces)***. In other words, the two cut surfaces of each end termination are not electroplated. Referring to Fig. 9 of the McGuire patent, a conductive layer 150 only has three conductive surfaces, wherein the other cut surfaces do not have conductive layers formed thereon.

Referring to Fig. 11 of the Barrett patent, each of the terminal electrodes (66), (68) are shown as only having three conductive surfaces (i.e., top, bottom, and right surfaces). In other words, the other two surfaces (i.e., front and back surfaces) are not covered with conductive layers.

In the present invention, a PTC sheet is cut into a plurality of strips. Four surfaces (the top, bottom, front, and back surfaces) of each strip are coated by an insulating layer. In contrast, the device described in McGuire only has two surfaces, rather than four surfaces, coated by an insulting layer. After the four surfaces of each strip are coated, the PTC sheet is cut into dices. Next, each dice is electroplated or dipped to form two terminal electrodes (218) on both ends of the dice, wherein each terminal electrode (218) has five conductive surfaces (i.e., top, bottom, right, left, and front surfaces) (referring to Figs. 13A and 13B).

To this end, claim 1 recites, in part, "two terminal electrodes, arranged on the two ends of the raw material substrate, each of the two terminal electrodes ***having five conducting surfaces for enclosing the insulating layer***...." Unlike the present application, neither McGuire nor Barrett disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces, and, thus, fails to teach each and every element of the claimed invention. Therefore, claim 1 is believed to be allowable over the cited reference.

Claims 2 - 6 depend from claim 1, and are believed to be allowable for at least the same reason as the claim from which they depend.

Rejections Under 35 U.S.C. § 103 -Obviousness

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over McGuire or Barrett in further view of U.S. Patent No. 4,993,142 to Burke et al. Notwithstanding the Examiner's statements, applicant hereby submits that the combination of Burke with McGuire or Barrett fails to teach or suggest each and every element of the claimed invention In particular, the Burke patent fails to remedy the deficiencies of the McGuire and Barrett patents by failing to teach or suggest that each terminal electrode (218) has five conductive surfaces. Therefore, claim 1 is believed to be allowable over the cited references.

Moreover, "a prior art reference must be considered in its entirety, including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983). Applicants submit that the Burke reference, when combined with the McGuire or Barrett references as suggested by the Examiner, not only fails to teach or

suggest all of the features of the Applicants' claims, but teaches away from the claimed invention. Thus, *prima facie* obviousness has not been established. (See MPEP 2142 and 2143).

Burke relates to a process for a Negative Temperature Coefficient (NTC) material which is opposite to the PTC material of the subject invention. Accordingly, applicant submits that the electrode structure described in Burke teaches away from electrode structure of the subject invention.

For example, the conductivity of the NTC material of Burke is positively proportional to temperature, and the ceramic material serving as NTC material has a poor conductivity under room temperature. In contrast, the conductivity of the PTC material (such as polymer conductive material) of the subject invention is inversely proportional to temperature. As a result, the polymer conductive material of the subject invention has a better conductivity under room temperature. As another example, the low dielectric insulating material of Burke, Al_2O_3 or ceramic oxide, has low sintering temperature and acid resistance. However, the insulating material of the subject invention, a polymer material, can prevent parts of metal foils and PTC material covered by the insulating material from being electroplated, so that a short circuit between the metal foils and the PTC material does not occur when electroplating is performed.

Moreover, since the NTC material of Burke and the PTC material of the subject invention have different characteristics, Burke and the subject invention disclose electrodes that are different in structure. For instance, Burke has two terminal electrodes, but does not have upper and lower electrodes on a body. In addition, the device of the subject invention is a variable resistor having the resistance:

$$R = \rho \frac{t}{A},$$

wherein r is volume resistivity, t is the thickness of the PTC material, and A is the area of the PTC material contacting with electrodes. The subject invention further discloses upper and lower metal foils formed on the PTC material. Each metal foil is etched to form a non-conductive gap, so that the metal foil is connected only to a corresponding terminal electrode having five conductive surfaces. Burke does not disclose such an arrangement. Thus, the combination of Burke, Barrett, and Mcguire does not render claim 1 obvious.

Claims 6 and 7 depend from claim 1, and are believed to be allowable for at least the same reasons as the independent claim from whey they depend.

Applicant further submits that the subject matter of Claims 1-7 distinguish over the remaining references. Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of U.S. Patent No. 6,223,423 to Hogge. Referring to Fig. 6 of the Hogge patent, each terminal electrode, similar to that of Citation 2, only has three conductive surfaces (12A, 22, 14A). Hogge does not disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of U.S. Patent No. 6,429,533 Li et al. Referring to Fig. 13 of Li, each terminal electrode (66, 68), similar to that of Citation 2, only has three surfaces (the top, bottom, and front surfaces). Li does not disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of U.S. Patent No. 5,831,510 to Zhang et al. Zhang relates to PTC electrical devices for installation on printed circuit boards. In Zhang, a material sheet is drilled to form holes, the holes are electroplated to connect upper and lower electrodes of the material sheet, and the sheet is cut into devices (referring to Fig. 11). Each electrode of the device disclosed in Zhang only has three conductive surfaces (65, 66, 67). The cut surfaces do not have conductive layers formed thereon. Therefore, Zhang does not disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of U.S. Patent No. 6,556.123 Iwao et al. In the Iwao patent, Fig. 5(a) show a single layer structure, Figs. 7(a), Fig. 9(a), Fig. 11(a) shows a two-layer structure, and Figs. 12(a), 14(a), 15(a) show a third-layer structure in which an electrode only has three conductive surfaces (the top, bottom, and right surfaces). Iwao does not disclose the technical feature of the present

invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of U.S. Patent No. 6,297,722 to Yeh. Referring to Fig. 4 of the Yeh patent, a plurality of spaced apart bores 201 of cross-shaped are formed in a material sheet. The plurality of spaced apart bores 201 are electroplated to connect upper and lower metal layers. The material sheet is cut into a plurality of dices along cutting lines 400. With this process, each terminal electrode of the dice has two corners electroplated with conductive layers. In other words, the other portion of each electrode along the cutting lines 400 is not electroplated. Therefore, Yeh does not disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of U.S. Patent No. 6,285,275 to Chen et al. Referring to Fig. 10 of the Chen patent, the right electrode, similar to electrode disclosed in the Yeh patent, only has three conductive surfaces (71, 7132). However, the cutting surface does not have conductive layer formed thereon. Similarly, the left electrode has the same structure as the right electrode. Chen does not disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of U.S. Patent No. 4,959,505 to Ott. Referring to Fig. 3 of the Ott patent, ribbon-shaped terminal elements (5, 6) are formed to connect upper electrode (4) and lower electrode (17). From Figs. 5.1-5.5, we note that right electrode only has three conductive surfaces. Similar to the right electrode, the left electrode only has three conductive surfaces. Ott does not disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Claims 1-7 of the subject application are neither anticipated nor rendered obvious in view of Japanese Patent No. 9-260106 to Inoue et al. Inoue discloses a process of manufacturing a ceramic thermistor in which glass is used to serve as an insulating material. Electrodes are formed by controlling the positions needed to be electroplated using non-electrolytic

electroplating. Inoue discloses an electrode structure similar to the electrode structure disclosed in Burke. Similarly, Inoue does not disclose the technical feature of the present invention that each terminal electrode (218) has five conductive surfaces. Therefore, the subject invention is allowable over the cited reference.

Summary and Concluding Remarks

The device of the subject invention is manufactured according to a passive device process, rather than PCB process. In the subject invention, chip forming is performed before electroplating. The top, bottom, front, and back surfaces of each chip is covered with an insulating layer so that the parts covered by the insulating layer can be prevented from being electroplated to cause a short circuit. In contrast, in the cited references, electroplating is performed before chip forming. Accordingly, each chip of the cited references does not need to have an insulating layer for protection. Moreover, each terminal electrode of the subject invention has five conductive surfaces, and, thus, differs in structure from the electrodes of the cited references.

In view of the foregoing, applicant respectfully submits that claims 1-7 are allowable and that the subject application is now in condition for allowance.

The Commissioner is hereby authorized to charge any fees that may be required during the entire pendency of this application to Deposit Account No. 19-1345.

Respectfully submitted,

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